relative abundances of H^1 and H^2 in natural terrestrial hydrogen, it is now necessary to know the past history of the hydrogen sample used by the observer and some of the discrepancies reported may be due to differences in the samples used.[3]

In addition to the electrolysis method for fractionating water, the distillation method could also be utilized by the unidirectional evaporation of a saturated brine at a sufficiently low temperature. While the theorectical efficiency of the process is less than that for the evaporation of liquid hydrogen itself, the experimental technique is much simpler and the process could be operated continuously with very little attention.

Various heterogeneous chemical reactions suggest themselves also as methods for securing fractionation of the two isotopes. Thus treatment of a large quantity of hydrochloric acid with iron or zinc should lead to a concentration of the H^2 isotope in the undecomposed residual acid.

* Publication approved by the Director of the Bureau of Standards of the U. S. Department of Commerce.

[1] Harold C. Urey, F. G. Brickwedde and G. M. Murphy, *Phys. Rev.*, **39**, 164 (1932); **39**, 536 (1932).

[2] See a forthcoming paper by G. M. Murphy and Harold C. Urey for experimental details.

[3] R. T. Birge and D. H. Menzel, *Phys. Rev.*, **37**, 1669 (1931); Walter Bleackney, *Phys. Rev.*, **39**, 536 (1932); Harold C. Urey, F. G. Brickwedde and G. M. Murphy, *Phys. Rev.*, **40**, 464 (1932); Kallman and Lazareff, *Naturwiss.*, **12**, 206 (1932).

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*THE ELECTRONIC STRUCTURE OF THE NORMAL NITROUS OXIDE MOLECULE**

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In a recent note[1] I applied a table of atomic radii for use in covalent molecules in predicting values of the moment of inertia of nitrous oxide, assuming various structures for the normal state. The values given are the following:

:N::N::O:	75.8	66.7	58.1×10^{-40} g. cm.^{2}
:N:::N:O:	75.3		
:N:N:::O:	75.2		

The three reasonable structures of the Lewis type lead to a moment of inertia of about 75×10^{-40} g. cm.^{2}. The structure corresponding to resonance between the first two Lewis structures gives a lower value, and that to resonance among all three a still lower value. It was pointed out in the note that the experimental value 59.4×10^{-40} g. cm.^{2} reported by Plyler and Barker agrees with the last of these to within about 2%, supporting the corresponding structure.

Professor R. M. Badger of this Laboratory observed that Plyler and Barker's data actually lead to 65.94×10^{-40} g. cm.^{2}, the lower value given by them being in error. The earlier conclusion regarding structure is consequently invalidated. The correct moment of inertia, however, agrees to within about 1% with the value 66.7×10^{-40} g. cm.^{2} predicted for the structure resonating between the Lewis structures $:\ddot{N}::N::\ddot{O}:$ and $:N:::N:\dot{\underset{\cdot\cdot}{O}}:$. The wave function for the normal nitrous oxide molecule is accordingly approximately represented by the sum of those for these two Lewis structures, with nearly the same coefficients, the contribution of the third Lewis structure given above being small. The nitrogen—nitrogen bond resonates between a double and a triple bond, approaching the latter in character, and the nitrogen—oxygen bond resonates between a single and a double bond, its properties being essentially those of a double bond. The structure might accordingly be written $N{\equiv}N{=}O$, even though the nitrogen atom cannot form more than four coexistent covalent bonds.

The choice of two of the three Lewis structures appears reasonable in the light of the rule, expressed by many authors, that stable electronic structures tend to leave atoms neutral or with small charges on assigning electrons to nuclei by splitting shared electron pairs. The central nitrogen atom in all three structures is N^+, this being required in order for it to form four covalent bonds. The first two structures, N^-N^+O and $N\,N^+O^-$, involve only single charges, and are essentially equivalent, contributing equally to the normal state, while the third, $N^{--}N^+O^+$, with a doubly-charged ion at one end, and two positive ions in juxtaposition, is less stable, and is not appreciably involved in the normal molecule.

* Contribution from Gates Chemical Laboratory, California Institute of Technology, No. 320.

[1] Linus Pauling, these PROCEEDINGS, **18**, 293 (1932).